Andhra Pradesh J Agril. Sci : 1(4): 85-89, 2015

WEED DYNAMICS, YIELD AND ECONOMICS OF PEARLMILLET (*Pennisetum glaucum* L.) AS INFLUENCED BY DIFFERENT WEED MANAGEMENT PRACTICES

SURYA PRAKASH MISHRA, Y. REDDI RAMU*, D. SUBRAMANYAM, V. UMAMAHESH, R. REDDI MANOJA AND G. PRABHAKAR REDDY

Department of Agronomy, S.V. Agricultural College, Tirupati-517502, A.P.

ABSTRACT

A field experiment was conducted during *kharif,* 2014 at dryland farm of S. V. Agricultural College, Tirupati to study the effects of integrated weed management on growth and yield of pearlmillet. Unweeded check resulted in significantly higher weed count, biomass and grain yield than rest of the treatments. An extent of 46.5 % yield reduction was observed with unweeded check over hand weeding twice at 20 and 40 DAS, which recorded significantly lower weed count, biomass and higher yield over rest of the weed management practices. However, it was comparable with pre-emergence application of atrazine @ 750 g *a.i.* ha^{-1} *fb* hand weeding at 30 DAS. Pre-emergence application of oxyflourfen @ 100 g *a.i.* ha^{-1} resulted in significantly lower yield due to poor weed control and its phytotoxic effects on the crop. In this investigation, integration of Pre - emergence application of atrazine or oxyflourfen *fb* post-emergence application of ethoxysulfuron @ 37.5 g *a.i.* ha^{-1} or chlorimuron-ethyl + metsulfuron-methyl @ 8 g *a.i.* ha^{-1} at 2-4 leaf stages of weeds did not have any significant impact on weed control and grain yield in pearlmillet.

KEYWORDS: Hand weeding, Grain yield, Phytotoxicity, Pre-emergence weed control

INTRODUCTION

Pearlmillet [*Pennisetum glaucum* (L.) R. Br. Emend. Stuntz.] is an important short duration and drought tolerant dual season cereal crop suitable even under adverse weather conditions. In India, it is cultivated over an area of 7.98 m ha with a production of 9.48 m ha and productivity of 1198 kg ha^{-1}. Weed infestation is considered as one of the major drawback during *kharif* to limit the yield in pearlmillet as weeds emerge along with the monsoon rains and cause severe competition for growth resources resulting in yield loss upto 40 % or more (Sharma and Jain, 2003).

Intercultivation and hand weeding being the predominant method of weed control in pearlmillet, labour scarcity during the peak period of farm operations has become a major bottle neck for manual weeding or intercultivation. The crux of the problem is accentuated if rainfall prolongs for a longer period, making it difficult for manual weeding. So, chemical weed management alone or in combination with mechanical methods has become indispensable for timely weed control, success of which depends mainly on method and depth of sowing as most of the soil applied herbicides cause phytotoxicity to the crop due to its small seed size and depth of sowing, particularly in direct sown pearlmillet.

MATERIAL AND METHODS

A field experiment was conducted at dryland farm of S. V. Agricultural College, Tirupati during *kharif,* 2014 on sandy loam soils with neutral in soil reaction (pH 7.2), low in organic carbon, available nitrogen and medium in available phosphorous and available potassium *i.e.* 232, 27.3 and 247.6 kg of N, P_2O_5 and K_2O ha^{-1}, respectively. The experiment was laidout in a randomized block design with ten treatments *viz.,* pre-emergence application of atrazine @ 750 g *a.i.* ha^{-1} (T_1), pre-emergence application of oxyflourfen 100 g *a.i.* ha^{-1} (T_2), pre-emergence application of atrazine @ 750 g *a.i.* ha^{-1} *fb* hand weeding at 30 DAS (T_3), pre-emergence application of oxyflourfen @ 100 g *a.i.* ha^{-1} *fb* hand weeding at 30 DAS (T_4), pre-emergence application of atrazine *fb* post-emergence application of chlorimuron-ethyl 10% + metsulfuron-methyl 10% @ 8 g *a.i.* ha^{-1} (T_5), pre-emergence application of atrazine *fb* post-emergence application of ethoxysulfuron @ 37.5 g *a.i.* ha^{-1} (T_6), pre-emergence application of oxyflourfen *fb* post-emergence application of chlorimuron-ethyl 10% + metsulfuron-methyl 10% @

8 g *a.i.* ha^{-1} (T_7), pre-emergence application of oxyflourfen *fb* post-emergence application of ethoxysulfuron @ 8 g *a.i.* ha^{-1} (T_8), hand weeding twice at 20 and 40 DAS (T_9) and weedy check (T_{10}), replicated thrice. Recommended dose of fertilisers 60kg N, 30kg P_2O_5 and 20 kg K_2O ha^{-1} was applied. Entire quantity of phosphorous and potassium and half of the nitrogen were applied as basal through single super phosphate and muriate of potash and urea, respectively. Remaining half of nitrogen was applied at 30 DAS. The test hybrid "PHB-306" was sown on 1st July with a spacing of 45 × 10 cm. Atrazine and oxyflourfen were applied as pre-emergence spray one day after sowing of the crop and ethoxysulfuron and chlorimuron-ethyl + metsulfuron-methyl at 2-4 leaf stage of weeds *i.e.* 20 DAS with a spray volume of 500 l of water ha^{-1}. Thinning and gap filling were done at 10 DAS. Hand weedings were carried out in the respective treatments at 20, 30 and 40 DAS. Weed density and dry weight were recorded by placing a quadrant of size 0.5 × 0.5 m randomly at three places in each plot and were subjected to square root transformation. Growth and yield attributes were recorded at different growth stages.

RESULTS AND DISCUSSION

Effects on weed

The major weed flora of the experimental site were *Cyperus rotundus* L. (30.7%), and *Cyperus iria* L. (17.0%) among sedges, *Digitaria sanguinalis* L. (9.8%) and *Echinochloa colona* L. (7.5%) among grasses and *Celosia argentia* L.(5.2%), *Commelina benghalensis* L. (4.8%), *Corchorus acutangulus* L. (4.6%), *Phyllanthus niruri* L. (4.3%), *Cleome viscosa* L. (4.1%) and *Merremia aegyptica* L. (3.7%) among broad leaved weeds density and dry weight of weeds were significantly influenced by different weed management practices in pearlmillet (Table 1). All the herbicidal treatments reduced the density and dry weight of weeds significantly compared to weedy check. The lowest density and dry weight of weeds was recorded with hand weeding twice at 20 and 40 DAS, which was comparable to pre-emergence application of atrazine *fb* hand weeding at 30 DAS as pre-emergence application of atrazine might have effectively hindered the germination of weeds, while hand weeding at 30 DAS removed the weeds at later stages of crop growth. Pre-emergence application of oxyflourfen registered higher density and dry weight of all categories of weeds due to phytotoxic effect of oxyflourfen on pearlmillet resulted in increased weed density in vacant spaces compared to pre-emergence application of atrazine. The highest density and dry weight of weeds were associated with weedy check. Among the weed management practices tried, the highest WCE was registered with hand weeding twice, which was however, at par with pre-emergence application of atrazine *fb* hand weeding at 30 DAS.

Effects on crop

All the growth parameters *viz.,* plant height and dry matter production were significantly higher with hand weeding twice at 20 and 40 DAS, which was comparable with pre-emergence application of atrazine *fb* hand weeding at 30 DAS. This might be due to weed free condition for a longer period during the crop ontogeny increasing the availability of growth resources to the crop (Table 2). The results are in line with Ram *et al.* (2005). The treatments involving pre-emergence application of oxyflourfen recorded lower values of the above growth parameters due to the phytotoxic effect of oxyflourfen on pearlmillet upto "4". Similar results were also reported by Das *et al.* (2013).

Hand weeding twice at 20 and 40 DAS recorded the highest yield attributes *i.e.* number of panicles $plant^{-1}$, number of grains $panicle^{-1}$, test weight, grain and straw yield of pearlmillet, which was comparable with pre-emergence application of atrazine *fb* hand weeding at 30 DAS. Weed free condition effectively increased the translocation of photosynthates from source to sink resulting in better yield attributes and thereby better grain yield. These above two treatments recorded 86.5% and 83.3% higher grain yield over weedy check (Table 2). The treatments associated with pre-emergence application of oxyflourfen resulted in reduced yield attributes and yield in pearlmillet. This might be due to lesser weed control and phytotoxic effect on crop reducing the grain and straw yield as a result of poor harnessing of utilization growth resources. Post-emergence application of either ethoxysulfuron or chlorimuron-ethyl + metsulfuron-methyl did not produce any significant increase in grain and straw yield. Weedy check recorded significantly lower grain and straw yield than rest of the weed management practices due to heavy weed infestation resulting in lesser availability of growth resources to the crop. These results were in line with DAS *et al.* (2013). Hand weeding twice at 20 and 40 DAS resulted in the highest gross returns, which was at par with pre-emergence application of atrazine *fb* hand weeding at 30 DAS. However, the latter treatment recorded the highest net returns and benefit-

Table 1. Weed density, dry weight and weed control efficiency at harvest as influenced by different weed management practices in pearlmillet

Treatments	Dose (*a.i.* ha^{-1})	Time of application (DAS)	Weed density (No. m^{-2})				Weed dry weight (g m^{-2})				WCE (%)
			Grasses	Sedges	BLWs	Total	Grasses	Sedges	BLWs	Total	
T_1 : Pre-emergence (PE) application of atrazine	750 g	1	21.00 (4.69)	95.66 (9.82)	22.00 (4.79)	138.66 (11.81)	5.14 (2.47)	24.85 (5.07)	5.66 (2.58)	35.52 (6.03)	56.0 (48.4)
T_2 : PE application of oxyflourfen	100 g	1	39.33 (6.34)	100.33 (10.05)	34.66 (5.97)	174.66 (13.23)	9.71 (3.27)	25.24 (5.12)	8.78 (3.12)	43.73 (6.68)	45.9 (42.6)
T_3 : T_1 + HW	750 g	1 + 20	7.66 (2.94)	18.33 (4.39)	7.66 (2.94)	33.66 (5.88)	1.92 (1.71)	4.64 (2.37)	2.08 (1.75)	8.64 (3.10)	89.2 (70.8)
T_4 : T_2 + HW	100 g	1 + 20	40.00 (6.39)	88.66 (9.46)	32.66 (5.80)	161.33 (12.74)	9.86 (3.28)	22.13 (4.80)	8.27 (3.04)	40.26 (6.42)	50.1 (45.0)
T_5 : T_1 + POE application of chlorimuron-ethyl + metsulfuron-methyl	750 g + 8 g	1 + 20	21.00 (4.69)	95.00 (9.78)	21.66 (4.75)	137.66 (11.76)	5.20 (2.47)	23.96 (4.99)	5.46 (2.54)	34.77 (5.98)	56.9 (49.0)
T_6 : T_1 + POE of ethoxysulfuron	750g + 37.5 g	1 + 20	35.00 (5.99)	78.00 (8.88)	20.66 (4.65)	133.66 (11.60)	8.74 (3.12)	19.59 (4.53)	5.36 (2.52)	33.71 (5.89)	58.2 (49.7)
T_7 : T_2 + POE application of chlorimuron-ethyl + metsulfuron-methyl	100 g + 8 g	1 + 20	23.33 (4.93)	118.00 (10.89)	34.00 (5.91)	165.66 (12.89)	5.78 (2.60)	29.06 (5.47)	8.56 (3.09)	43.41 (6.66)	46.2 (42.8)
T_8 : T_2 + POE application of ethoxysulfuron	100 g + 37.5 g	1 + 20	49.00 (7.05)	81.00 (9.05)	33.33 (5.85)	163.33 (12.81)	11.89 (3.58)	20.33 (4.61)	8.40 (3.06)	40.62 (6.44)	49.7 (44.8)
T_9 : Hand weeding twice at 20 and 40 DAS	-	20 & 40	7.33 (2.88)	17.33 (4.27)	7.33 (2.88)	32.00 (5.73)	1.84 (1.68)	4.42 (2.32)	2.03 (1.74)	8.29 (3.04)	89.7 (71.3)
Weedy check	-	-	86.66 (9.36)	177.33 (13.33)	71.66 (8.49)	335.66 (18.33)	21.49 (4.74)	41.25 (6.50)	18.1 (4.35)	80.84 (9.04)	-
SEm±	-	-	0.17	0.29	0.16	0.26	0.08	0.10	0.07	0.09	0.85
CD (P=0.05)	-	-	0.53	0.86	0.50	0.80	0.23	0.32	0.21	0.28	2.5

Table 2. Yield attributes, yield and economics of pearlmillet as influenced by different weed management practices

Treatments	No. of panicles plant^{-1}	No. of grains panicle^{-1}	Test weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Net returns (Rs. ha^{-1})	B:C ratio
T1 : PE application of atrazine	2.36	907.5	5.92	2289	5097	27789	2.74
T2 : PE application of oxyflourfen	1.96	831.2	5.83	1860	4245	19438	2.20
T3 : T1 + HW at 30 DAS	2.80	927.7	6.10	2936	6158	36115	2.82
T4 : T2 + HW at 30 DAS	2.13	845.2	5.89	2055	4646	19298	1.96
T5 : T1 + POE application of chlorimuron-ethyl + metsulfuron-methyl	2.46	912.3	6.06	2339	5148	27858	2.65
T6 : T1 + POE application of ethoxysulfuron	2.53	915.2	6.08	2398	5244	28399	2.63
T7 : T2 + POE application of chlorimuron ethyl + metsulfuron-methyl	2.00	837.2	5.85	1915	4368	19634	2.15
T8 : T2 + POE application of ethoxysulfuron	2.06	841.5	5.88	2007	4556	20814	2.18
T9 : Hand weeding twice at 20 and 40 DAS	2.81	930.5	6.08	2976	6368	33737	2.46
T10 :Weedy check	1.71	770.5	5.75	1595	3701	15247	1.99
SEm±	0.072	20.28	0.054	77.5	149.5	1350	0.072
CD (P=0.05)	0.21	60.2	0.16	232	447	4042	0.21

cost ratio due to its lower cost of cultivation. The treatments with pre-emergence application of oxyflourfen recorded lesser gross, net returns and benefit-cost ratio due to lower yield level and higher cost of cultivation. The lowest gross, net returns and benefit-cost ratio were realized with weedy check due to the lowest yield associated with it.

REFERENCES

Das, J., Patel, B.D., Patel, V.J and Patel, R.B. 2013. Comparative efficacy of different herbicides in summer pearlmillet. *Indian Journal of Weed Science.* 45(3): 217-218.

Sharma, O.L and Jain, N.K. 2003. Integrated weed management in pearlmillet. *Indian Journal of Weed Science*. 35: 134-135.

Ram, B., Chaudhury, G.R., Jat, A.S and Jat, M.L. 2005. Effect of integrated weed management and intercropping systems on growth and yield of pearlmillet (*Pennisetum glaucum*). *Indian Journal of Agronomy*. 50(3): 210-213.